Transducer Research, Inc.

Field-Usable Portable Analyzer for Chlorinated Organic Compounds

Technology Need:

Widespread use of chlorinated solvents such as carbon tetrachloride, trichloroethylene, and perchloroethylene has resulted in contamination problems in the air, soil, and ground water at many Department of Energy (DOE) sites. Characterizing the extent of chlorinated hydrocarbon contamination, controlling remediation treatment processes, and monitoring of regulatory compliance frequently require hundreds or thousands of analyses. Traditional sampling and off-site laboratory analysis methods are expensive and do not provide the immediate results needed for health and safety protection and effective process control. "Real-time" chlorinated hydrocarbon detectors are needed to address this problem.

Technology Description:

A fully portable, hand-held, solid-state-sensor-based monitoring system that measures low concentrations of chlorinated organic compounds has been developed. The system is capable of detecting chlorinated hydrocarbons in the range of 0.2-25 ppm and up to 500 ppm with an internal dilution feature that is incorporated into the instrument. The portable analyzer can be used to analyze samples from start-up in less than 15 minutes or in a continuous monitoring mode in 10 minutes or less. The system is designed for field use by technicians wearing protective clothing and for easy maintenance. The instrument can be operated from an AC line or from an internal battery.

The sensor developed for this instrument relies on increased conductivity when heated and exposed to hydrogen chloride (HCl) and chlorinated hydrocarbon compounds. Examples of common chlorinated hydrocarbons detected include carbon tetrachloride, trichloroethylene and tetrachloroethylene. The sensor used in this instrument is not responsive to nonchlorinated hydrocarbons, oxygenated compounds, or nitrogenated compounds. The sensor responds to chlorinated organics even when nonchlorinated organics, such as motor fuels and waste oils, are present. Many field instruments cannot selectively distinguish between chlorinated and nonchlorinated compounds.

Fully Portable, Hand Held Solid-State Monitoring Device

To extend the lifetime of the sensor, an analytic duty cycle was custom-programmed to have a short exposure time

coupled with a long recovery time. Generally the chemical analyses are performed in a 90 second period followed by a 5 to 10 minute zeroing time to allow sensor recovery. Through the addition of a diluter interface, sensor life is extended by restricting sensor exposure to a predetermined concentration level.

Benefits:

<Selective detection of chlorinated organics in mixture with other hydrocarbons

<Reduced analytical costs through screening to reduce the number of samples requiring laboratory analysis

<Nearly immediate results and low limits of detection enhance applications for worker health and safety monitoring, process monitoring, or initial characterization of spills and historical releases

<Portable, hand-held (twelve pounds total weight), and can be operated by technicians with minimal training

Status and Accomplishments:

This project was completed in October 1996. A fully portable hand-held solid-state monitoring device, the RCL MONITOR, has been demonstrated to show its capability of detecting very low levels of chlorinated organic compounds. The RCL MONITOR has been incorporated in the Routine Quarterly Monitoring Program at the Idaho National Engineering & Environmental Laboratory (INEEL). Specifically, the role of this instrument in the Routine Quarterly Monitoring has consisted of quarterly groundwater and vapor sampling and analysis for chlorinated organic contamination in wells surrounding the Radioactive Waste Management Complex (RWMC).

Deployments and demonstrations include:

<Deployed in 1995 at INEEL in routine quarterly monitoring and at a cost savings of $185 per sample

<The portable analyzer was demonstrated and deployed in 1995 at Hanford's 200 Area to monitor levels of chlorinated hydrocarbons in bore holes within the 200 Area, without requiring the extraction of samples and analysis off-site

<Full-Scale Demonstration at SRS in 1997

<Winner of R&D 100 Award

Transducer Research Incorporated has been purchased by TSI, of St. Paul Minnesota. TSI is not currently manufacturing and marketing the RCL sensor, but they did sell 3 sensors to the Occupational Safety and Health Administration (OSHA) for $8,500 each to be used in ES&H activities

Contacts:

William J. Buttner
Transducer Research, Inc.
Phone: (651) 490-4068
E-mail: None

C. Edward Christy
National Energy Technology Laboratory
Phone: Phone: (304) 285-4604
E-mail: cchris@netl.doe.gov

Online Resources:

Office of Science and Technology, Technology Management System (TMS), Tech ID # 313
http://ost.em.doe.gov/tms

The National Energy Technology Laboratory Internet address is http://www.netl.doe.gov

For additional information, please visit TSI's website at http://www.tsi.com/